

- CSMA** Carrier Sense Multiple Access—Media-access mechanism wherein devices ready to transmit data first check the channel for a carrier. If no carrier is sensed for a specific period of time, a device can transmit. If two devices transmit at once, a collision occurs and is detected by all colliding devices. This collision subsequently delays retransmissions from those devices for some random length of time.
- CTS** Clear to Send—Hardware signal defined by the RS-232 specification that indicates that a transmission can proceed.
- CLASS** Custom Local Area Signaling Services—CLASS is a service mark of Bellcore. It is the signaling service available such as caller-id, call waiting, and auto-redial.
- DCD** Data Carrier Detected—Hardware signal defined by the RS-232-C specification that indicates that a device such as a modem is online and ready for transmission.
- DCE** Data Communication Equipment—A communications device that can establish, maintain, and terminate a connection (for example, a modem). A DCE may also provide signal conversion between the data terminal equipment (DTE) and the common carrier's channel.
- DCF** Disengage Confirm—This is a call flow message.
- DHCP** Dynamic Host Configuration Protocol—A protocol that allows network administrators to centrally manage and automate the assignment of Internet Protocol (IP) addresses in their organization's network.
- DHTML** Dynamic Hypertext Markup Languages—A name for a set of programs that developers can use to create Web pages that update themselves on the fly. Dynamic HTML makes your Web documents more interactive than HTML.
- DIMM** Dual Inline Memory Module—Has a 10% higher capacity bandwidth than Single In-line memory module (SIMM). The DIMM's data path is 128 bits wide.
- DIN** Deutsche Institute fur Normung (German Institute for Standardization)—DIN specifications are issued under the control of the German government. The most common specification is the dimensions of cable connectors referred to as DIN connectors.
- DINS** Dialed Number Identification Service
- DIP** Dual Inline Package—These are small on and off switches on the circuit board used to configure the board in a semipermanent way. The DIP switches are the first thing to look at when a configuration isn't what you intended after an installation.
- DMS** Digital Multiplex System—A digital switch that is used in a central office. It contains multiple devices to handle the many needs of the system. Such as, local/toll exchange, long distance switch, international gateway, local and long distance switch, wireless, and advanced signaling solutions.
- DNS** Domain Name Server—System used in the internet for translating names of network nodes into addresses.

- DRAM** Dynamic Random Access Memory—The readable/writable memory used to store data in PCs. DRAM stores each bit of information in a "cell" composed of a capacitor and a transistor.
- DRJ** Disengage Reject—This is a call flow message.
- DRQ** Disengage Request—This is a call flow message.
- DS** Digital Signal—Standard specifying the electrical characteristics for data transmission over four-wire telco circuits. DS1 is 1.544 Mbps, and DS3 is 44.736 Mbps. Also referred to as T1 and T3.
- DS0** 1. Digital Signal level zero—It is equivalent to one voice conversation digitized under PCM. It transmits digital signals over a single channel at 64-kbps on a T1 facility 2. Data Slot 0
- DSP** Digital Signaling Processors—A special computer chip designed to process digital signals that were originally analog signals.
- DSR** Data Set Ready—This is a call flow message.
- DTE** Data Terminal Equipment—End-user equipment, typically a terminal or computer, that can function as the source or destination point of communication on the network.
- DTMF** Dual Tone Multi-frequency—The sounds a touch-tone telephone makes when its keys are pressed.
- DTR** Data Terminal Ready—A control signal that is activated to let the DCE know when the DTE is ready to send and receive data.
- DTS** Data Transformation Service—Technology designed for bypassing functions for short-hop, line-of-sight applications. It never converts to analog. Its main use is in high volume, data only applications in urban areas where line costs are higher.
- ECC** Error Correcting Code—Code that determines whether line noise has caused data to be garbled or dropped in transit, and then works to correct the problem. The two most common error-correction protocols and standards used by analog modems are MNP and V.42.
- EdgeServer Pro Card** This card on the Total Control Chassis runs Windows NT 4.0 Server, provides two 10/100-Mbps ethernet interfaces, and routes call over IP networks.
- Edge server card** This card on the Total Control Chassis runs Windows 2000 Server, provides two 10/100-Mbps ethernet interfaces, and routes call over IP networks.
- EDO RAM** Extended Data Out Random Access Memory—A more efficient method to access memory. It reduces access memory time by 10% over the standard DRAM chips.
- EIA** Electronic Industries Alliance—A trade organization who sets standards for electronics.
- EMC** Electromagnetic Compatibility—The ability of a device or system to function without error in its intended electromagnetic environment.
- EMI** Electromagnetic Interference—The leakage of radiation from equipment.

- ESD** Electrostatic Discharge—Discharge of stored static electricity that can damage electronic equipment and impair electrical circuitry, resulting in complete or intermittent failures.
- ESF** Extended Super Frame—Framing type used on T1 circuits that consists of 24 frames of 192 bits each, with the 193rd bit providing timing and other functions. ESF is an enhanced version of super frame (SF).
- ESIG** Extended Signaling—A system internal to Total Control which ingresses and distributes SS7 signaling throughout the Chassis via the packet bus.
- ETSI** European Telecommunications Standards Institute—Similar to the ANSI in the United States. Its purpose is to provide standards for the telecommunications industry.
- FCC** Federal Communications Commission—A United States federal regulatory agency which oversees all aspects of the communications industry, TV, radio, telephone etc. in the United States.
- FTP** File Transfer Protocol—Application protocol, part of the TCP/IP protocol stack, for transferring files between network nodes. FTP is defined in RFC 959.
- GCF** Gatekeeper Confirm—This is a call flow message.
- GK** Gatekeeper—A device that manages an IP network, supporting all gateways, user profiles, and authentication. A gatekeeper is defined by the H.323 standard.
- GRJ** Gatekeeper Reject—This is a call flow message.
- GRQ** Gatekeeper Request—This is a call flow message.
- GSM** Global System for Mobile Communications—The European standard for digital cellular service using slow frequency-hopping and TDMA.
- GW** VoIP Media Gateway—A CommWorks VoIP device that can interconnect networks with different, incompatible communications protocols. The gateway performs a layer-7 protocol-conversion to translate one set of protocols to another (for example, from TCP/IP to SNA or from TCP/IP to X.25). A gateway operates at OSI layers up through the Session Layer.
- GUI** Graphical User Interface—A software interface based on pictorial representations and menus of operations, commands, and files. Opposite of the operating system command line interface.
- HDB3** High Density Bipolar Three Zeros—A bipolar coding method that does not allow more than three consecutive zeros in the line signaling.
- HDM** High Density Modem—The HiPer DSP card in the VoIP system. It implements the PSTN interface and CODEC functions of the VoIP system. It contains 24 channels per card (T1-PRI) or 31 (E1-PRI) channels per card.
- IC** Industry Canada—A department of the Canadian government. It serves to promote all aspects of Canada's economy. Its charter is to improve conditions for investment, improve innovation performance, increase Canada's share of global trade and build a fair, efficient and competitive marketplace.

- IDE** Integrated Drive Electronics—Standard interface to the hard disk drive on the PC.
- IEC** International Electrotechnical Commission—The international standards body for electrotechnology.
- IIS** Internet Information Server—Microsoft Windows NT web based server. It allows you to create control and manage a web site remotely.
- IMT** Inter-Machine Trunks—In the SS7 network, the IMT is the channel that carries the data to the SSP.
- ISUP** Integrated Services Digital Network User Part —This is the control function of the SS7 protocol. It determines the call setup, administration, and call take down on the SS7 network. In the SS7 system with VoIP enabled, the ISUP commands are converted to SLAP commands.
- I/O** Input/Output
- IP** Internet Protocol—A set of instructions that controls the node addresses, routes the messages, and so on of the internet.
- IP Telephony Manager** IP Telephony Manager is a software application developed by CommWorks, a division of 3Com, that runs on a UNIX management station. This application remotely manages 3Com Network Application Cards (NACs) and Network Interface Cards (NICs) through a Network Management Card (NMC) installed on the CommWorks 5210 IP Telephony Platform.
- ISA** Industry Standard Architecture—The most common bus architecture on the motherboard of a MS-DOS based computer.
- ISDN** Integrated Service Digital Network—A system that provides simultaneous voice and high-speed data transmission through a single channel to the user. ISDN is an international standard for end-to-end digital transmission of voice, data, and signaling.
- ITG** Internet Telephony Gateway— A bridge between traditional circuit-switched telephony and the internet that extends the advantages of IP telephony to the standard telephone by digitizing the standard telephone signal (if it isn't already digital), significantly compressing it, packetizing it for the internet using Internet Protocol (IP,) and routing it to a destination over the internet.
- ITU** International Telecommunications Union—An organization established by the United Nations, of which almost every nation is a member. Its charter is to define standards for telegraphic and telephone equipment.
- LAN** Local Area Network—A short distance data communications network. Usually found within a building or a campus environment.
- LCF** Location Confirm—This is a call flow message.
- LEC** 1. Local Exchange Carrier—The telephone company servicing the local area. 2. Line Echo Canceler—A module placed on the line to keep the noise and vibration on the line to a minimum.
- LED** Light Emitting Diode—Semiconductor device that emits light. Status lights on hardware devices are typically LEDs.

- LRI** Location Reject—This is a call flow message.
- LRQ** Location Request—This is a call flow message.
- MBP** Management Bus Protocol—This protocol was developed by 3Com and is used in the NMC to communicate to the other cards in the Total Control chassis.
- MFC** Multifrequency Compelled—An E1 call setup protocol that requires the signals to be acknowledged.
- MIB** Management Information Base—A key element of SNMP management systems. A collection of objects that can be accessed via a network management protocol; holds information about all resources managed by a network management system.
- NAC** Network Access Card—the card in front of the Total Control chassis. It connects to the NIC in back. It allows the Total Control chassis to receive information from the NMC, then processes it and sends it out the NIC.
- NANP** North American Numbering Plan—The scheme used to identify the telephone trunks. It is composed of a three digit prefix and the four-digit suffix.
- NDC** National Destination Code—Used to identify a Public Land Mobile Network (PLMN) within a country.
- NAC** Network Application Card—In the Total Control chassis, this card is located in the front of the chassis. It allows communication to the VoIP application.
- NIC** Network Interface Cards—In the Total Control chassis, this card is located in the back of the chassis. It allows access to the network.
- NMC** Network Management Card—The NMC provides the management of all the cards in the Total Control chassis.
- NLP** Non-Linear Processing—Processing of a request for service that does not take the normal route as defined by the PSTN.
- NMC** Network Management Card—Manages all of the devices in the Total Control chassis under the direction of a PC running IP Telephony Manager software.
- NSM** Non-Standard Message—A type of non-standard message that is allowed by ITU T.30.
- NTFS** NT File System—The file system on Windows NT servers.
- NTP** Network Time Protocol—Protocol built on top of TCP that assures accurate local time-keeping with reference to radio and atomic clocks located on the internet. This protocol is capable of synchronizing distributed clocks within milliseconds over long time periods.
- NVRAM** Non-volatile Random Access Memory—Ram that retains its contents when a unit is turned off.

**OOBMAN** Out-of-band Manager—OOBMan is an application that runs on 3Com Windows NT components of the CommWorks IP Telephony platform.

It is designed to allow a user to dial into an NT device, using a terminal emulation program such as Hyperterminal, and view or modify various configuration information on that machine.

- OS** Operating System—A software program that controls and manages the operations of a computer system.
- OOF** Out-of-frame—OOF conditions occurs in a T1 transmission when two or more out of four consecutive framing bits are in error.
- OOS** Out-of-service—The term used when a module or card is not functioning. It could be because VoIP has taken it OOS due to errors, or because the card or module has been removed from the chassis.
- PCI** Peripheral Component Interconnect—Designed by Intel. It is a 32-bit local bus on a PC to transfer data between the CPU and the peripherals.
- PCM** Pulse Code Modulation—Technique for converting an analog signal to a digital signal.
- POTS** Plain Old Telephone System—Standard telephone service used by most residential locations. See PSTN.
- PRI** Primary Rate Interface—ISDN interface to primary rate access. In the U.S., the Primary Rate Interface is split into 23 B channels and one 64 Kbps D channel. PRI is delivered over the same physical link as a T1, or 1.55 Mbps link. In Europe, PRI is split into 30 B channels and one 64 k bit/second D channel and is delivered over the same physical link as an E1.
- PSI** Power Supply Interface—The card on the chassis that controls the power for the chassis.
- PSTN** Public Switched Telephone Network—The analog dial-tone-type telephone networks and services in place worldwide, with transmission rates up to 52Kbps. In contrast, telephone services based on digital communications lines, such as ISDN, have higher speeds and bandwidths. The POTS networks also called the public switched telephone network (PSTN).
- PSU** Power Supply Unit—This unit is part of the Total Control chassis. It controls the power to the chassis. The PSU can be either AC or DC power with 35A, 45A, 70A, or 130A ratings.
- QOS** Quality of Service—An indicator of the performance of a transmission system on the Internet and other networks. QoS is measured in transmission rate, error rates, latency, and other characteristics, and can to some extent be guaranteed to a customer in advance.
- RAS** Remote Access Service—Remote access is sending and receiving data to and from a computer or controlling computer with terminals or PCs connected through phone/communications links. A remoter access service provides this function.



- RCF** Registration Confirm—This is a call flow message.
- RISC** Reduced Instruction Set Computer— Central processing unit architecture that greatly reduces processing time by having fewer, simpler instructions programmed into ROM, but allowing for complex processing by combining these simple instructions; primarily used in workstations.
- RFI** Radio Frequency Interface—An interface of a programmable switch matrix between the RF test instruments of a CASS RF or CNI configuration to a series of front panel bulkhead connectors.
- RRAS** Routing and Remote Access Service—Microsoft Windows NT's (RRAS) Routing and Remote Access Service is used for terminating RAS/PPP calls on a Microsoft Windows NT system.
- RRJ** Registration Reject—A registration request from an H.323 Gateway to an H.323 Gatekeeper was rejected.
- RRQ** Registration Request—An H.323 Gateway has requested to register with a remote H.323 Gatekeeper endpoint.
- RTP** Real Time Protocol—The format of the audio/voice data as it travels through VoIP.
- RTS** Request to Send—An RS-232 signal provided by a DTE device to a DCE device saying "I am ready when you are". The RTS/CTS RS-232 signals are often used for flow control between a modem and serial port.
- SCSI** Small Computer System Interface—The way the peripherals communicate with the computer's main processor.
- SDL** Signaling Data Link or Software Download
- SF** Super Frame—Common framing type used on T1 circuits. SF consists of 12 frames of 192 bits each, with the 193rd bit providing error checking and other functions. SF is superseded by ESF, but is still widely used. Also called D4 framing.
- SCP** Service Control Points—The SCP stores customer specific information for example, toll free numbers, and converts the information received from the incoming call and directs the call to its destination.
- SIP** Session Initiation Protocol—Provides advanced telephony services across an IP network.
- SGP** Signaling Gateway Platform—This is the SS7 Signaling Gateway platform. 3Com's SS7 signaling Gateway is an intelligent service exchange node that integrates services between the circuit and packet networks to deliver significant cost savings with IMTs for voice trunk access instead of ISDN PRIs.
- SLAP** Signaling LAN Application Protocol—SLAP is the interface between the Total Control Chassis and the external SS7 Gateway system. It replaces the D-channel signaling that normally exists in an ISDN PRI interface. SLAP is 3Com's proprietary software.
- SSP** Signaling Switch Point—Simply put, this is the telephone switch.

- SS7** Signaling System 7—A global standard for telecommunications as defined by the International Telecommunication Union (ITU). The SS7 standard defines the procedure protocol by which network elements in the PSTN exchange information over a digital signaling network.
- SMS** System Management Services—Allows provisioning and updating of information on subscribers and services in near-real time for billing and administrative purposes.
- SNMP** Simple Network Management Protocol—Standardized method of managing and monitoring network devices on TCP/IP-based internets. A standard way for computers to share networking information. In SNMP, two types of communicating devices exist: agents and managers. An agent provides networking information to a manager application running on another computer. The agents and managers share a database of information, called the Management Information Base (MIB). An agent can use a message called a traps-PDU to send unsolicited information to the manager.
- SQL** Structured Query Language—A standard interactive and programming language for requesting information from and updating databases.
- SRAM** Static Random Access Memory—Type of RAM that retains its contents for as long as power is supplied. SRAM does not require constant refreshing, like DRAM.
- SS** Silence Suppression—A way to save on bandwidth by not transmitting the silences or gaps in conversation. A voice compression process where the time when there is no voice being transmitted over the line during a conversation, that space is filled with data, and video transmission on the line.
- SST** Silence Suppression Threshold—The limit of silence allowed on the voice transmission before data, and video packets are sent on the line. This can be defined by the user.
- STP** Signal Transfer Point—SS7 Signal Routing Node. It is a very reliable packet switch used to forward signaling messages in an SS7 network. The network switches and the SCPs connect directly to the STPs for message routing.
- SVGA** Super Video Graphics Array—An enhancement of the VGA display standard. SVGA can display at least 800 pixels horizontally and about 600 lines vertically.
- TCM** Total Control Manager—See IP Telephony Manager.
- TCP** Transmission Control Protocol—Connection-oriented protocol that provides a reliable byte stream over IP. A reliable connection means that each end of the session is guaranteed to receive all of the data transmitted by the other end of the connection, in the same order that it was originally transmitted without receiving duplicates.
- TDM** Time Division Multiplexing—A technique in which information from multiple channels can be allocated bandwidth on a single wire based on preassigned time slots. Bandwidth is allocated to each channel regardless of whether the station has data to transmit.



- TDMA** Time Division Multiplexing Adapter—A device that allows analog voice and data devices to work through an ISDN connection. The terminal adapter is a protocol converter that adapts equipment not designed for ISDN, such as phones, faxes, and modems.
- TFTP** Trivial File Transfer Protocol—simplified version of the File Transfer Protocol (FTP) that transfers files but does not provide password protection or user directory capability.
- Total Control Manager** TCM—See IP Telephony Manager.
- UCF** Unregistration Confirm
- UDP** User Datagram Protocol—Connectionless transport layer protocol in the TCP/IP protocol stack. UDP is a simple protocol that exchanges datagrams without acknowledgments or guaranteed delivery, requiring that error processing and retransmission be handled by other protocols. UDP is defined in RFC 768.
- UI** User Interface—In telephony terms, this is the reference point for the BRI connection between a telephone company local loop and the customer equipment.
- UL** Underwriters Laboratory—A non-profit laboratory that examines and tests items submitted by their manufactures for safety.
- UNC Names** Universal Naming Convention Names—Naming conventions for file names or other resources beginning with '\', indicating that they exist on a remote computer.
- URJ** Unregistration Reject—This is a call flow message.
- URQ** Unregistration Request—This is a call flow message.
- UTP** Unshielded Twisted Pair— Four-pair wire medium used in a variety of networks. It consists of copper conductors that are electrically balanced.
- VDE** Verbund Deutscher Electronicker—Federation of German Electrical Engineers, similar to the IEEE in the United States.
- VFPD** Virtual Front Panel Display—Refers to the GUI display of the Total Control 1000 chassis.
- VoIP** Voice Over Internet Protocol—A set of protocols for managing the delivery of voice and data information using the Internet Protocol (IP). Voice and data information is sent in digital form in discrete packets over the Internet instead of in analog form over the public switched telephone network (PSTN). A major advantage of VoIP is that it avoids the tolls charged by ordinary telephone service.
- VRAM** Virtual Random Access Memory
- WAN** Wide Area Network—Public or private computer network serving a wide geographic area.

**ZCS** Zero Code Suppression—Used primarily with T1. The insertion of a one bit to prevent the transmission of eight consecutive zeros on an active line. When eight or more consecutive zeros are detected on the line, the system considers the line inactive, and releases the line.

# INDEX

## Numerics

10/100 Ethernet Aux I/O NIC specifications 53  
130A power supply specifications 50

## A

about this guide ix  
Accounting Server 27  
acronyms 67  
ActiveX 26

## B

Back-end Server 25  
Billing Support Server 27, 28  
billing system 31

## C

cable type 44  
cabling specifications 43  
call attempts 23  
call control 31, 40  
    messages 29  
    progress tones 31  
    settings 33  
    signaling path 33  
call detail record (see CDR) 20  
call flow 15  
    ISUP 35  
    PRI 34  
    setup 33  
    SIP to SIP 39  
    SS7 15, 40  
    SS7 and SIP 40  
    types 33  
call models 18  
Canada 47  
capacity 20  
    Gatekeeper 21  
    system 20, 31  
CDR 20, 23, 27, 31  
chassis specifications 49  
class-5 switch 14  
CODEC 19, 20  
CommWorks 5000 29  
CommWorks system  
    call flows 33  
    call models 18  
    cards 19  
    components 14  
    features 31  
    messaging 19  
    regulatory compliance 47  
    specifications 48  
components  
    Accounting Server 27

Back-end Server 25  
Billing Support Server 27, 28  
billing system 31  
CommWorks system 14  
Directory Mapping Server 25  
Distributed Directory Server 31  
dual-homed 42  
fax over IP 31  
Gatekeeper 23  
Gateway 18  
HiPer DSP card 22  
HiPer NMC 21, 22  
international dialing 31  
Provisioning Server 26  
SIP Proxy Server 24  
software 31  
specifications 47  
configuration  
    Gateway 18  
    spans 43  
connectors  
    RJ45 43  
    RJ48C 43  
contacting CommWorks Technical Support xi  
conventions, document x

## D

data transformation service 28  
DHTML 26  
Directory Mapping Server 25  
    functions 26  
Distributed Directory Server 31  
documentation, related x  
DTS package 28  
dual-homed 42

## E

E.164 26  
echo cancellation 48  
edge server  
    capacity 20  
    ethernet 45  
    ethernet interfaces 44  
    NAC specifications 55  
    operating system 19  
EdgeServer Pro  
    NAC specifications 56  
    operating system 19  
ethernet  
    interfaces 44  
    pinouts 43  
    requirements 43  
Exceed 30

## F

fan tray specifications 51  
FastStart 33  
fax 31  
frame size 20

## G

G.711 15, 19  
G.723.1 19  
    overview 15  
G.729A 19  
Gatekeeper  
    BHCA 23  
    capacity 21  
    Distributed Directory Server 31  
    overview 23  
Gateway  
    configuration 18  
    overview 17  
    spans 43  
    web access 29  
glossary 67

## H

H.225 33  
HiPer DSP 22  
    cabling 43  
    function 21  
    NAC specifications 63  
    NIC pinouts 42  
    NIC specifications 64  
    spans 43  
HiPer Network Management Card (See HiPer DSP) 21  
HiPer NMC  
    cabling specifications 44  
    ethernet interfaces 43  
    functions 22  
    SNMP 21  
    specifications 52  
HP OpenView 29  
HP-UX 30  
http  
    //totalservice@commworks.com. ix  
Hummingbird Exceed 30

## I

international dialing 31  
International Dialing Support 20, 31  
Internet Explorer 30  
introduction 13  
IP network  
    management 41  
    voice 41  
IP Telephony Manager

managing components 31

## J

JavaScript 26  
jitter buffer  
    size 48  
junction box 43

## L

logging 19

## M

management applications 30  
Management Information Base (MIB) 22  
management IP network 41  
management software 31  
messages 19  
    real-time 29  
Microsoft Internet Explorer 26  
Microsoft SQL Server 25

## N

NANP 26  
Network Management Card 21  
    proxy agent 28  
network planning 41  
North American Numbering Plan 26

## O

operating system 19  
overview, CommWorks system 13

## P

PCI dual ethernet NIC specifications 59  
PCM 17  
peripheral NIC specifications 57  
pinouts  
    ethernet 43  
    HiPer DSP NIC 42  
power supply specifications 50  
progress tones 31  
Provisioning Server 26  
PSTN 17  
public switched telephone network (PSTN)  
    17  
pulse-code modulation 17

## Q

Q.931 33

## R

real-time billing 31  
regulatory compliance  
    Canadian 47  
    U.S. 47  
related documentation x  
release notes ix  
requirements  
    ethernet 43

RFC 2543 24  
RJ45 connectors 43  
RJ-48C 43  
RJ48C connectors 43  
routes, static 42  
RTP 15, 48

## S

SCSI 19  
signalling  
    SLAP 17  
SIP  
    call flow 39  
    SS7 call flow 40  
SIP Proxy Server  
    features 24  
SLAP 17  
SLAP v.2 Protocol 17  
SNMP 21, 28  
    HiPer NMC 22  
    system chart 29  
software 31  
spans 20  
    configuration 43  
    Gateway 43  
    HiPer DSP 43  
specifications 47  
    10/100 Ethernet Aux I/O NIC 53  
    130A power supply 50  
    chassis 49  
    edge server NAC 55  
    EdgeServer Pro NAC 56  
    fan tray 51  
    HiPer DSP NAC 63  
    HiPer DSP NIC 64  
    HiPer NMC NAC 52  
    PCI dual ethernet NIC 59  
    peripheral NIC 57  
    system 48  
    Total Control 49  
SS7  
    call flow 15, 40  
    connection types 14  
    diagram 15  
    SIP call flow 40  
    SLAP 17  
static routes 42  
statistics 29  
Sun Solaris 30  
Super CDR 28  
support xi  
switch  
    class-5 14  
system  
    capacity 20, 31  
    messages 19  
    specifications 48  
system flow 29

## T

T.38 31  
terms 67  
tones 31  
Total Control specifications 49  
traffic flow (see call flow) 15  
transparent trunking 19

## U

UDP 48  
UDPTL frames 31  
UNIX 30

## V

Van Jacobson compression 48  
voice IP network 41  
VoIP  
    call flow 34  
    components 14  
    connections 13  
    overview 13

## W

web browser 29  
website ix





CommWorks Corporation  
3800 Golf Road  
Rolling Meadows, IL 60008

©2001  
3Com Corporation  
All rights reserved  
Printed in the U.S.A.

Part Number 10044866





## **Exhibit C-4**

**Lucent Technologies**  
Bell Labs Innovations



# **MAX TNT<sup>®</sup> True Access<sup>™</sup> Operating System (TAOS) 8.0-103 (MultiVoice)**

Addendum

Part Number: 7820-0683-001  
For software version 8.0-103  
April 2000

**Copyright© 2000 Lucent Technologies. All Rights Reserved.**

This material is protected by the copyright laws of the United States and other countries. It may not be reproduced, distributed, or altered in any fashion by any entity (either internal or external to Lucent Technologies), except in accordance with applicable agreements, contracts or licensing, without the express written consent of Lucent Technologies, Inc.

**Notice**

Every effort was made to ensure that the information in this document was complete and accurate at the time of printing. However, information is subject to change.

**Security Statement**

In rare instances, unauthorized individuals make connections to the telecommunications network through the use of access features.

**Trademarks**

DSLPipe, DSLMAX, DSL Terminator, DSLTNT, MAX, MAX TNT, MultiDSL, MultiVoice, Pipeline, GRF, NavisRadius, NavisAccess, and Stinger are trademarks of Lucent Technologies. Other trademarks and trade names mentioned in this publication belong to their respective owners.

**Ordering Information**

To order copies of this document, contact your Lucent Technologies representative or reseller.

**Support Telephone Numbers**

For a menu of support and other services, call (800) 272-3634. Or call (510) 769-6001 for an operator.

**Lucent Technologies**

## Contents

<i>Customer Service.....</i>	<i>vii</i>
<b>Notices and known issues .....</b>	<b>ix</b>
<i>Notice about MAX TNT TAOS 8.0.1 and 8.0-103 .....</i>	<i>ix</i>
<i>Notice of modified RADIUS port and ID space defaults.....</i>	<i>ix</i>
<i>Notice of modified behavior during IPDC negotiation .....</i>	<i>x</i>
<i>Notice of discontinuance of software support.....</i>	<i>x</i>
<i>Notice about upgrading slot cards.....</i>	<i>x</i>
<i>Known issues in this release .....</i>	<i>xi</i>
<b>Upgrade and downgrade procedures .....</b>	<b>1</b>
<i>Requirements and recommendations .....</i>	<i>1</i>
<i>Obtaining the MAX TNT TAOS 8.0-103 software .....</i>	<i>1</i>
<i>Local access to the unit recommended .....</i>	<i>1</i>
<i>32-MB JEDEC DRAM card required for this release .....</i>	<i>1</i>
<i>Flash size limitations for this upgrade .....</i>	<i>1</i>
<i>Saving the system configuration .....</i>	<i>2</i>
<i>Upgrade instructions.....</i>	<i>3</i>
<i>If you are upgrading from MAX TNT TAOS 7.0V .....</i>	<i>3</i>
<i>Upgrading a standalone MAX TNT unit .....</i>	<i>4</i>
<i>Upgrading a multishelf MAX TNT unit .....</i>	<i>4</i>
<i>Downgrade instructions.....</i>	<i>6</i>
<i>Downgrading a standalone MAX TNT unit .....</i>	<i>6</i>
<i>Downgrading a multishelf MAX TNT unit .....</i>	<i>7</i>

---

**MultiVoice features in MAX TNT TAOS 8.0-103 ..... 9**

<b>Modem manager.....</b>	<b>9</b>
<i>Firmware versions for digital modems .....</i>	<i>9</i>
<i>Firmware versions for MultiDSP cards .....</i>	<i>9</i>
<i>Series56 III modem card support .....</i>	<i>9</i>
<i>Expanded MultiDSP card support .....</i>	<i>10</i>
<b>MultiVoice operations .....</b>	<b>10</b>
<i>System requirements for VoIP .....</i>	<i>11</i>
<i>Ethernet requirements for VoIP processing .....</i>	<i>11</i>
Full-duplex mode required .....	11
Compatible configuration in connecting port of hub or router .....	12
<i>Overview of VoIP call routing .....</i>	<i>12</i>
<i>Overview of VoIP in an H.323v2 environment .....</i>	<i>13</i>
<i>Overview of VoIP in an SS7 IPDC 0.12 environment .....</i>	<i>14</i>
<i>General system configuration for VoIP support .....</i>	<i>15</i>
Disabling ICMP Destination Unreachable packets for VoIP calls .....	15
Preventing receipt of UDP packets until VoIP calls are set up .....	16
System settings for VoIP operations .....	17
<i>Call route configuration .....</i>	<i>18</i>
Using DNIS-specific trunk mappings .....	18
Process voice and data calls on different MultiDSP cards .....	19
Configuring preferred source routing .....	21
Use trunk routing (optional) for outbound voice calls .....	21
<i>VoIP call management and performance settings .....</i>	<i>22</i>
<i>New VoIP profile settings in MAX TNT TAOS 8.0-103 .....</i>	<i>23</i>
Configuring multiple logical gateways (MLG) .....	24
New Trunk and Call status reporting .....	27
Trunk and DS0 selection (per call) .....	28
Configuring the H.245 pipeline signal model .....	29
Enabling fax packet redundancy .....	30
Enabling fixed-sized fax packets for backwards compatibility .....	32
Configuring the fax data transmission rate .....	32
<i>Modified E1 profile settings in MAX TNT TAOS 8.0-103 .....</i>	<i>33</i>
Enabling DTMF-R2 signal processing .....	34
Collecting 15-digit dial strings .....	35
<i>New VoIP profile settings in MAX TNT TAOS 8.0.1 .....</i>	<i>35</i>
Storing voice announcements in the FAT-16 flash memory file system .....	36
Allowing fallback to alternate codecs .....	37
Deactivating trunks used for VoIP calls .....	37
Enabling early ringback .....	38
Trunk prefixing .....	39
<i>Real-time fax .....</i>	<i>39</i>
Overview of real-time fax settings .....	39
Example real-time fax configuration .....	40
<i>Transparent modem .....</i>	<i>40</i>
Overview of transparent modem settings .....	40
Example transparent modem configuration .....	41
<i>Using transparent modem with real-time fax .....</i>	<i>41</i>
Example real-time fax and transparent modem configuration .....	41
Limitation for low-speed modems .....	42



---

<i>IPDC message support for modifying parameters</i> .....	42
<i>IPDC message support for fax and transparent modem</i> .....	43
<i>New trunk features for VoIP calls</i> .....	43
Configurable interdigit timer for T1 inband signaling .....	43
Delaying charges until call is answered (true connect) .....	44
Gatekeeper CLID substitution .....	45
<i>RT-24 (proprietary) codec support</i> .....	46
<i>G.728 codec support</i> .....	46
<i>SNMP: Support for the VoIP MIB (ascend 28)</i> .....	47
<i>SNMP: Traps for VoIP-related conditions</i> .....	48
<i>NavisAccess support for VoIP call reporting</i> .....	49
Start records .....	49
Stop records .....	50
Call Progress records .....	51



---

## **Customer Service**

Customer Service provides a variety of options for obtaining information about Lucent products and services, software upgrades, and technical assistance.

### **Finding information and software on the Internet**

Visit the Web site at <http://www.ascend.com> for technical information, product information, and descriptions of available services.

Visit the FTP site at <ftp.ascend.com> for software upgrades, release notes, and addenda to this manual.

### **Obtaining technical assistance**

You can obtain technical assistance by telephone, email, fax, modem, or regular mail, as well as over the Internet.

#### ***Enabling Lucent to assist you***

If you need to contact Lucent for help with a problem, make sure that you have the following information when you call or that you include it in your correspondence:

- Product name and model.
- Software and hardware options.
- Software version.
- If supplied by your carrier, Service Profile Identifiers (SPIDs) associated with your line.
- Your local telephone company's switch type and operating mode, such as AT&T 5ESS Custom or Northern Telecom National ISDN-1.
- Whether you are routing or bridging with your Lucent product.
- Type of computer you are using.
- Description of the problem.

#### ***Calling Lucent from within the United States***

In the U.S., you can take advantage of Priority Technical Assistance or an Advantage service contract, or you can call to request assistance.

##### ***Priority Technical Assistance***

If you need to talk to an engineer right away, call (900) 555-2763 to reach the Priority Call queue. The charge of \$2.95 per minute does not begin to accrue until you are connected to an engineer. Average wait times are less than three minutes.

##### ***Advantage Services***

Advantage Services is a comprehensive selection of services. Installation services help get your Lucent Wide Area Network (WAN) off to the right start. Ongoing maintenance and

---

support services provide hardware and software solutions to keep your network operating at peak performance. For more information, call (800) 272-3634, or access the Web site at [www.ascend.com](http://www.ascend.com) and select Services and Support, then Advantage Services.

### ***Other telephone numbers***

For a menu of Lucent's services, call (800) 272-363. Or call (510) 769-6001 for an operator.

### ***Calling Lucent from outside the United States***

You can contact Lucent by telephone from outside the United States at one of the following numbers:

Telephone outside the United States	(510) 769-8027
Austria/Germany/Switzerland	(+33) 492 96 5672
Benelux	(+33) 492 96 5674
France	(+33) 492 96 5673
Italy	(+33) 492 96 5676
Japan	(+81) 3 5325 7397
Middle East/Africa	(+33) 492 96 5679
Scandinavia	(+33) 492 96 5677
Spain/Portugal	(+33) 492 96 5675
UK	(+33) 492 96 5671

For the Asia Pacific Region, you can find additional support resources at <http://apac.ascend.com>

### ***Obtaining assistance through correspondence***

Lucent maintains two email addresses for technical support questions. One is for customers in the United States, and the other is for customers in Europe, the Middle East, and Asia. If you prefer to correspond by fax, BBS, or regular mail, please direct your inquiry to Lucent's U.S. offices. Following are the ways in which you can reach Customer Service:

- Email from within the U.S.—[support@ascend.com](mailto:support@ascend.com)
- Email from Europe, the Middle East, or Asia—[EMEAsupport@ascend.com](mailto:EMEAsupport@ascend.com)
- Fax—(510) 814-2312
- Customer Support BBS (by modem)—(510) 814-2302

Write to Lucent at the following address:

Attn: Customer Service  
 Lucent Technologies  
 1701 Harbor Bay Parkway  
 Alameda, CA 94502-3002

## Notices and known issues

### ***Notice about MAX TNT TAOS 8.0.1 and 8.0-103***

The core and extended features available in MAX TNT TAOS 8.0.1 are incorporated in TAOS 8.0-103. Details about using TAOS features, other than MultiVoice, may be found in the MAX TNT True Access™ Operating System (TAOS) 8.0.1 Addendum.

### ***Notice of modified RADIUS port and ID space defaults***

**Note:** This modification could cause authentication failures with RADIUS servers that do not support distinct UDP source ports. If your RADIUS server does not support authentication requests from multiple source ports, you must reset the modified parameters to their previous values.

The default settings for User Datagram Protocol (UDP) source ports and ID spaces for communication with a RADIUS server have been changed from single to multiple. Following are the relevant parameters, shown with the new default settings:

```
[EXTERNAL-AUTH]
rad-id-space = distinct
rad-id-source-unique = port-unique
```

MAX TNT units can use either a single global source UDP port for all slot cards, or a unique port for each card. Similarly, a unit can use one ID space for both authentication and accounting requests, or a distinct space for each type of request.

Previous TAOS versions recommended the use of multiple source ports and ID spaces for performance reasons, and because use of a single source port and ID space reduces the number of simultaneous requests that the unit can generate. However, the default settings configured a single global source port and ID space to ensure compatibility with all RADIUS servers.

In this release, the default settings have been changed to the recommended values.

If the system was already using the recommended settings, this change will have no effect.

Systems that used the previous default settings will respond as follows:

- If the RADIUS server supports distinct source ports, the system will experience a slight improvement in performance.
- If the RADIUS server does not support distinct source ports, the system will experience problems with RADIUS authentication and accounting.

To communicate with RADIUS servers that do not support distinct source ports, you must modify the External-Auth profile as follows to restore the parameters to their previous values:

```
admin> read external-auth
EXTERNAL-AUTH read

admin> set rad-id-space = unified

admin> set rad-id-source-unique = system-unique
```

**Notices and known issues*****Notice of modified behavior during IPDC negotiation***

---

```
admin> write
EXTERNAL-AUTH written
```

***Notice of modified behavior during IPDC negotiation***

In previous releases, the MAX TNT unit's system address was used during IP Device Control (IPDC) protocol negotiation. In previous releases, if the System-IP-Addr parameter was null, the shelf controller IP address was used.

Since MAX TNT TAOS 8.0.1, the MAX TNT unit requires a valid System-IP-Addr setting to complete IPDC negotiation. For example, the following commands explicitly set the system address to the shelf controller IP address:

```
admin> get ip-int { {1 c 1} 0} ip-address
ip-address = 10.2.3.4

admin> read ip-global
IP-GLOBAL read

admin> set system-ip-addr = 10.2.3.4

admin> write
IP-GLOBAL written
```

**Note:** If the System-IP-Addr setting is null, the system terminates PPP connections during the IPCP negotiation phase.

***Notice of discontinuance of software support***

Software support has been discontinued for the MAX TNT Ethernet-0 slot card (TNT-SL-E10), the Fast (100 MB) Ethernet-1 slot card (TNT-SL-E100), and the older MAX TNT Hybrid Access slot cards (TNT-SL-HA128 and TNT-SL-HA192).

***Notice about upgrading slot cards***

If you replace a MAX TNT Fast (100 MB) Ethernet-1 slot card (TNT-SL-E100) with a newer Ethernet card (TNT-SL-E10-100 or TNT-SL-E100-V-C), you must write new Ethernet profiles for the new card. The old Ethernet profiles do not carry forward.

If you replace an older MAX TNT Hybrid Access slot card (TNT-SL-HA128 or TNT-SL-HA192) with a newer Hybrid Access card (TNT-SL-HDLC2 or TNT-SL-HDLC2-EC-C), and if you replace a MAX TNT Series56 modem card (TNT-SL-48MOD-S56) with a newer Series56 card (TNT-SL-48MOD-S-C or TNT-SL-48MODV3-S-C), you must write new profiles for the new cards.

If you replace a Series56 modem card (TNT-SL-48MOD-S56, TNT-SL-48MOD-SGL, TNT-SL-48MOD-S-C or TNT-SL-48MODV3-S-C) with a MultiDSP card (TNT-SL-ADI-C, TNTV-SL-ADI-C, or APX8-SL-96DSP), you must write new profiles for the new cards.

For any slot whose card type is being changed, you should perform a `slot -r` command after downing (`slot -d`) or removing the existing card prior to inserting a new card type.